

REMARKS

I. Introduction

These amendments and remarks are being filed in response to the Office Action dated January 11, 2008. No new matter has been added.

Claims 1-51 and 54-55 are pending in this application. Claims 2, 4, 5 and 8-53 were withdrawn by the Examiner following a restriction requirement.

Withdrawn claims 52 and 53 have been cancelled without prejudice.

Claims 54 and 55 have been added. Support for claims added claims 54 and 55 is found in the specification, for example on page 3, lines 7-10.

Claim 1 has been amended to further distinguish the present disclosure over the prior art in an effort to expedite prosecution. Support for the amendment is found in the specification, for example at page 32, lines 23-35.

No new matter has been added.

For the following reasons this application should be allowed and the case passed to issue.

II. Title

The Examiner objected to the title as allegedly not being descriptive. Applicants respectfully submit that the title as currently amended is descriptive of the pending claims, satisfying the requirements of 37 CFR 1.72 and thereby obviating the objection.

III. Claim Rejections under 35 U.S.C §102

Claims 1, 3, 6 and 7 were rejected under 35 U.S.C. §102(e) as allegedly being anticipated by Seto et al., U.S. 2004/0038520 and also by Mitsui U.S. 6,693,318.

Claims 1, 3, 6 and 7 were rejected under 35 U.S.C. §102(b) as allegedly being anticipated by Hattori et al., JP 05-218035.

Claims 1, 6 and 7 were rejected under 35 U.S.C. §102(b) as allegedly being anticipated by Ueno JP 200-252357 also by Faust U.S. 2002/0001944.

Claims 1, 6 and 7 were rejected under 35 U.S.C. §102(e) as allegedly being anticipated by Akahori U.S. 6,720,659 and also by Oizumi 6,747,353.

Applicants respectfully disagree. However, claim 1 has been amended to further distinguish the present disclosure over the prior art in an effort to expedite prosecution. Support for the amendment is found in the specification, for example at page 32, lines 23-35.

Claim 1 now recites:

A semiconductor device comprising:
an insulation film formed on a substrate;
a buried metal interconnect formed in the insulation film; and
a barrier metal film formed between the insulation film and the metal interconnect,
wherein the barrier metal film is a metal compound film, and
wherein the metal compound film contains at least one of the elements forming the insulation film and is made of at least one selected from a group consisting of Ti, Zr, Hf, Nb, W, V, Mo, Os, Rh, Ir, Pd and Pt or any alloy thereof.

Anticipation under 35 U.S.C. § 102 requires that “each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.”

Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ 2d 1051, 1053 (Fed Cir. 1987). At a minimum, the cited prior art does not disclose (expressly or inherently) that “the metal compound film contains at least one of the elements forming the insulation film and is made of at least one selected from a group consisting of Ti, Zr, Hf, Nb, W, V, Mo, Os, Rh, Ir, Pd and Pt or any alloy thereof.”

Turning to the cited prior art, Seto describes an insulation film, a barrier film having the composition TaN and a copper interconnect. (See, Seto paragraph 38).

Seto **does not** disclose a metal compound film that contains at least one of the elements forming the insulation film and is made of at least one selected from a group consisting of Ti, Zr, Hf, Nb, W, V, Mo, Os, Rh, Ir, Pd and Pt or any alloy thereof.

Therefore Seto fails to teach or suggest the subject matter of claim 1.

The Examiner alleges that Mitsui describes a barrier metal film 6. As described in Mitsui at col. 4, wire 6 is copper. Furthermore, Mitsui describes an insulation film, and a barrier layer which requires the presence of Ta and N. As such Mitsui fails to disclose all of the elements of claim 1.

The Examiner alleges Hattori describes an insulation film and a barrier metal 4. However, Hattori specifies that film 4 is RuO₂, (see, abstract). As discussed above, claim 1, as amended recites a metal compound film that contains “at least one of the elements forming the insulation film and is made of at least one selected from a group consisting of Ti, Zr, Hf, Nb, W, V, Mo, Os, Rh, Ir, Pd and Pt or any alloy thereof.”

As such, Hattori fails to disclose all of the elements recited in claim 1.

The Examiner alleges that Ueno describes an insulation film 4, formed on a substrate 2, a buried metal interconnect 8 formed in the insulation film, and a barrier metal film 10 formed between the insulation film and metal interconnect. However, as described in Ueno, the film 10 is Cu, (see Abstract).

In contrast, the subject matter as defined in amended claim 1, recites that the metal compound film contains at least one of the elements forming the insulation film and is made of at least one selected from a group consisting of Ti, Zr, Hf, Nb, W, V, Mo, Os, Rh, Ir, Pd and Pt or any alloy thereof.

Therefore, Ueno fails to disclose all of the elements of claim 1 and fails to anticipate the claim 1.

The Examiner alleges that Akahori shows a barrier metal film 88. However, as shown in FIG. 16, 88 comprises Cu, and not “at least one selected from a group consisting of Ti, Zr, Hf, Nb, W, V, Mo, Os, Rh, Ir, Pd and Pt or any alloy thereof,” as recited in claim 1.

Therefore, Akahori fails to anticipate claim 1.

The Examiner alleges that Faust in Figure 1, shows a barrier metal film 14. As recited in amended claim 1, barrier metal film is “a metal compound film, and wherein the metal compound film contains at least one of the elements forming the insulation film and is made of at least one selected from a group consisting of Ti, Zr, Hf, Nb, W, V, Mo, Os, Rh, Ir, Pd and Pt or any alloy thereof.”

In contrast, Faust does not require that the metal compound film contain at least one of the element forming the insulation film and one of the recited elements. Rather, Faust describes that barrier layer 14 is “typically tantalum, tantalum nitride or some other binary transition metal nitride.” (See, Faust paragraph 4).

Therefore, Faust fails to disclose all of the elements of claim 1 and fails to anticipate the claim 1.

Similarly, Oizumi is alleged by the Examiner to show a barrier metal film 20. As recited in amended claim 1, barrier metal film is “a metal compound film, and wherein the metal compound film contains at least one of the elements forming the insulation film and is made of at least one selected from a group consisting of Ti, Zr, Hf, Nb, W, V, Mo, Os, Rh, Ir, Pd and Pt or any alloy thereof.”

In contrast, Oizumi does not disclose or suggest that the metal compound film contain at

least one of the element forming the insulation film and one of the recited elements. Rather Oizumi describes that barrier layer 20 is “an amorphous film of a refractory silicon nitride, such as TaSiN.” (See Oizumi col. 5, lines 62-67).

Therefore, Oizumi t fails to disclose all of the elements of claim 1 and fails to anticipate the claim 1.

Accordingly, none of the prior art cited, disclose all of the elements of the claims as recited in claim 1.

Furthermore more claims 3, 6 and 7 depend from allowable claim 1 and therefore are also allowable over the cited prior art references.

Moreover, the structure as defined in the claims result in an unexpected improvement in adhesion.

IV. Conclusion

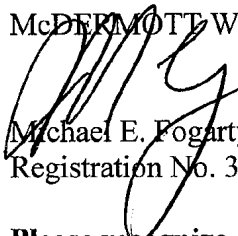
In view of the above amendments and remarks, Applicants submit that this application should be allowed and the case passed to issue. If there are any questions regarding this Amendment or the application in general, a telephone call to the undersigned would be appreciated to expedite the prosecution of the application.

Application No.: 10/578,003

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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